

AMENDMENTS TO THE CLAIMS

Amendments to the Claims:

Please cancel claims 1-46 and add new claims 47-140 as follows. This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims

Claims 1-46 (Cancelled)

47. (New) An apparatus for treating one or more samples comprising:
- (a) a reaction vessel for holding the one or more samples and including at least one inlet for flowing the one or more samples into the reaction vessel and at least one outlet for flowing the one or more samples out of the reaction vessel; and
 - (b) an acoustic energy source for providing at least one focused acoustic field having a frequency of between about 100 kilohertz and about 100 megahertz to the one or more samples while the one or more samples are in the reaction vessel.
48. (New) The apparatus of claim 47, wherein the focused acoustic field has a focal zone smaller than the reaction vessel.
49. (New) The apparatus of claim 47, wherein the focused acoustic field has a focal zone larger than the reaction vessel.
50. (New) The apparatus of claim 47 including a processor for controlling the flow of the sample into and out of the reaction vessel to control exposure of the one or more samples to the at least one focused acoustic field.
51. (New) The apparatus of claim 47 including a processor for controlling the acoustic energy source to control exposure of the one or more samples to the at least one focused acoustic field.
52. (New) The apparatus of claim 47 including a processor for varying the frequency of the acoustic energy source to control exposure of the one or more samples to the at least one focused acoustic field.
53. (New) The apparatus of claim 47 including a feedback system having a sensor for providing feedback information relevant to the one or more samples.

54. (New) The apparatus of claim 53 including a processor for determining a state of treatment of the sample based, at least in part, on the feedback information.
55. (New) The apparatus of claim 54, wherein the processor controls the flow of the sample based, at least in part, on the determination of the state of treatment.
56. (New) The apparatus of claim 54, wherein the processor controls the acoustic energy source based, at least in part, on the determination of the state of treatment.
57. (New) The apparatus of claim 53, wherein the sensor includes an acoustic transducer for detecting acoustic emissions from the one or more samples.
58. (New) The apparatus of claim 53, wherein the sensor includes an acoustic transducer for detecting acoustic reflections from the one or more samples.
59. (New) The apparatus of claim 53, wherein the sensor includes a temperature sensor and the feedback information includes temperature information.
60. (New) The apparatus of claim 53, wherein the sensor includes optical detection and the feedback information includes spectral information.
61. (New) The apparatus of claim 60, wherein the spectral information includes at least one of spectral excitation, absorption, fluorescence, and emission of the one or more samples.
62. (New) The apparatus of claim 47, wherein the at least one focused acoustic field includes a plurality of focused acoustic fields and the acoustic energy source includes a plurality of acoustic transducers for providing the plurality of the focused acoustic fields to the one or more samples.
63. (New) The apparatus of claim 47 including a positioning system for positioning at least one of the sample and the focused acoustic source relative to each other.
64. (New) The apparatus of claim 62 including a processor for controlling the positioning system to stop sample movement relative to the acoustic energy source to facilitate the treating of the one or more samples.
65. (New) The apparatus of claim 62, including a processor for controlling the positioning system to dither a relative position of the one or more samples and the focal zone.
66. (New) The apparatus of claim 47, wherein the one or more samples include organic material.

- 67. (New) The apparatus of claim 47, wherein the one or more samples include inorganic material.
- 68. (New) The apparatus of claim 47, wherein the one or more samples include a mineral.
- 69. (New) The apparatus of claim 47, wherein the one or more samples include a biological.
- 70. (New) The apparatus of claim 47 including suspending the one or more samples in a fluid.
- 71. (New) The apparatus of claim 68, wherein the fluid includes a solvent.
- 72. (New) The apparatus of claim 47, wherein the treatment includes mixing the one or more samples with a constituent.
- 73. (New) The apparatus of claim 72, wherein the constituent includes a solvent.
- 74. (New) The apparatus of claim 72, wherein the one or more samples include a first molecule and the constituent includes a second molecule, different from the first molecule.
- 75. (New) The apparatus of claim 72, wherein the one or more samples include an antibody and the constituent includes a molecule to which the antibody binds.
- 76. (New) The apparatus of claim 72, wherein the one or more samples include a substrate and the constituent includes a ligand.
- 77. (New) The apparatus of claim 72, wherein the one or more samples include at least one of an antibody and a receptor and the constituent include a support surface for immobilizing the at least one of the antibody and the receptor.
- 78. (New) The apparatus of claim 72, wherein the one or more samples include a first nucleic acid molecule and the constituent includes a second nucleic acid, different from the first nucleic acid molecule.
- 79. (New) The apparatus of claim 72, wherein the first nucleic acid molecule is a primer and the second nucleic acid molecule is a substrate molecule.
- 80. (New) The apparatus of claim 47, wherein the treatment includes fluidization of the one or more samples.
- 81. (New) The apparatus of claim 47, wherein the treatment includes heating of the sample.
- 82. (New) The apparatus of claim 47, wherein the treatment includes disrupting at least portions of the sample.

83. (New) The apparatus of claim 47, wherein the treatment includes increasing a permeability of the one or more samples.
84. (New) The apparatus of claim 47, wherein the treatment includes enhancing a reaction within the one or more samples.
85. (New) The apparatus of claim 47, wherein the treatment includes sterilizing the one or more samples.
86. (New) The apparatus of claim 47, wherein the treatment includes disrupting extra-cellular membranes.
87. (New) The apparatus of claim 47, wherein the treatment includes lessening a barrier function of a structure in the one or more samples.
88. (New) The apparatus of claim 47 including a processor for controlling the acoustic energy source to be on during a treat interval and off during a dead interval.
89. (New) The apparatus of claim 88, wherein the processor controls a frequency of operation of the acoustic energy source.
90. (New) The apparatus of claim 88, wherein the processor controls a duty cycle of operation of the acoustic energy source.
91. (New) The apparatus of claim 47, further comprising a system for transferring the reaction vessel into or out of the treatment apparatus.
92. (New) An apparatus for treating a sample using acoustic energy, comprising:
- (a) an acoustic energy source for generating a focused acoustic field having a frequency of between about 100 kilohertz and about 100 megahertz and which converges in a focused acoustic field; and
 - (b) a conduit for flowing the sample through the focused acoustic field to mix the sample with a constituent in the conduit.
93. (New) An apparatus for treating one or more samples using acoustic energy, comprising:
- (a) an acoustic energy source for generating a focused acoustic field having a frequency of between about 100 kilohertz and about 100 megahertz and which converges in a focused acoustic field;
 - (b) a reaction vessel for holding a sample;

(c) a positioning system for moving at least one of the sample and the acoustic energy source relative to each other; and

(d) a processor for controlling at least one of the acoustic energy source and the positioning system to expose the sample to the focused acoustic field for a time sufficient to mix the sample with a constituent in the reaction vessel.

94. (New) A method for treating one or more samples comprising:

(a) flowing the one or more samples through a reaction vessel; and

(b) providing at least one focused acoustic field having a frequency of between about 100 kilohertz and about 100 megahertz to the one or more samples while the one or more samples is in the reaction vessel.

95. (New) The method of claim 94, wherein the focused acoustic field has a focal zone smaller than the reaction vessel.

96. (New) The method of claim 94, wherein the focused acoustic field has a focal zone larger than the reaction vessel.

97. (New) The method of claim 94 including controlling the flow of the one or more samples into and out of the reaction vessel to control exposure of the one or more samples to the at least one focused acoustic field.

98. (New) The method of claim 94 including controlling the acoustic energy source to control exposure of the one or more samples to the at least one focused acoustic field.

99. (New) The method of claim 94 including a varying the frequency of the acoustic energy source to control exposure of the one or more samples to the at least one focused acoustic field.

100. (New) The method of claim 94 including providing feedback information relevant to the one or more samples.

101. (New) The method of claim 100 including determining a state of treatment of the one or more samples based, at least in part, on the feedback information.

102. (New) The method of claim 101 including controlling the flow of the one or more samples based, at least in part, on the determination of the state of treatment.

103. (New) The method of claim 101 including controlling the acoustic energy source based, at least in part, on the determination of the state of treatment.

104. (New) The method of claim 100 including detecting acoustic emissions from the one or more samples.
105. (New) The method of claim 100 including detecting acoustic reflections from the one or more samples.
106. (New) The method of claim 100, wherein the feedback information includes temperature information.
107. (New) The method of claim 100, wherein the feedback information includes spectral information.
108. (New) The method of claim 107, wherein the spectral information includes at least one of spectral excitation, absorption, fluorescence, and emission of the sample.
109. (New) The method of claim 94, wherein the at least one focused acoustic field includes a plurality of focused acoustic fields.
110. (New) The method of claim 94 including positioning at least one of the one or more samples and the focused acoustic field relative to each other.
111. (New) The system of claim 109 including controlling the positioning to stop sample movement relative to the focused acoustic field to facilitate the treating of the one or more samples.
112. (New) The method of claim 109, including controlling the positioning to dither a relative position of the sample and the focal acoustic field.
113. (New) The method of claim 94, wherein the one or more samples include organic material.
114. (New) The method of claim 94, wherein the one or more samples include inorganic material.
115. (New) The method of claim 94, wherein the one or more samples include a mineral.
116. (New) The method of claim 94, wherein the one or more samples include a biological.
117. (New) The method of claim 94 including suspending the one or more samples in a fluid.
118. (New) The method of claim 117, wherein the fluid includes a solvent.
119. (New) The method of claim 94, wherein the treatment includes mixing the one or more samples with a constituent.
120. (New) The method of claim 119, wherein the constituent includes a solvent.

121. (New) The method of claim 119, wherein the one or more samples include a first molecule and the constituent includes a second molecule, different from the first molecule.
122. (New) The method of claim 119, wherein the one or more samples include an antibody and the constituent includes a molecule to which the antibody binds.
123. (New) The method of claim 119, wherein the one or more samples include a substrate and the constituent includes a ligand.
124. (New) The method of claim 119, wherein the one or more samples include at least one of an antibody and a receptor and the constituent include a support surface for immobilizing the at least one of the antibody and the receptor.
125. (New) The method of claim 119, wherein the one or more samples include a first nucleic acid molecule and the constituent includes a second nucleic acid, different from the first nucleic acid molecule.
126. (New) The method of claim 119, wherein the first nucleic acid molecule is a primer and the second nucleic acid molecule is a substrate molecule.
127. (New) The method of claim 94, wherein the treatment includes fluidization of the sample.
128. (New) The method of claim 94, wherein the treatment includes heating of the sample.
129. (New) The method of claim 94, wherein the treatment includes disrupting at least portions of the sample.
130. (New) The method of claim 94, wherein the treatment includes increasing a permeability of the sample.
131. (New) The method of claim 94, wherein the treatment includes enhancing a reaction within the sample.
132. (New) The method of claim 94, wherein the treatment includes sterilizing the sample.
133. (New) The method of claim 94, wherein the treatment includes disrupting extra-cellular membranes.
134. (New) The method of claim 94, wherein the treatment includes lessening a barrier function of a structure in the sample.
135. (New) The method of claim 94 including controlling the focused acoustic field to be on during a treat interval and off during a dead interval.

136. (New) The method of claim 94 including controlling a frequency of focused acoustic field.
137. (New) The method of claim 94 including controlling a duty cycle of operation of the focused acoustic field.
138. (New) The method of claim 94 including transferring the reaction vessel into or out of a treatment apparatus.
139. (New) A method for treating a sample using acoustic energy, comprising:
- (a) generating a focused acoustic field having a frequency of between about 100 kilohertz and about 100 megahertz and which converges in a focused acoustic field; and
 - (b) flowing the sample through the focused acoustic field to mix the sample with a constituent in a conduit.
140. (New) An method for treating one or more samples using acoustic energy, comprising:
- (a) generating a focused acoustic field having a frequency of between about 100 kilohertz and about 100 megahertz and which converges in a focused acoustic field;
 - (b) holding a sample in a reaction vessel;
 - (c) moving at least one of the sample and the focused acoustic field relative to each other; and
 - (d) controlling at least one of the focused acoustic field and the positioning to expose the sample to the focused acoustic field for a time sufficient to mix the sample with a constituent in the reaction vessel.